Citation:

Umesawa M, Sato S, Imano H, Kitamura A, Shimamoto T, Yamagishi K, Tanigawa T, Iso H. Relations between protein intake and blood pressure in Japanese men and women: The Circulatory Risk in Communities Study (CIRCS). *Am J Clin Nutr.* 2009 Aug; 90 (2): 377-384.

PubMed ID: 19515740

Study Design:

Cross-sectional study

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the association between protein intake and blood pressure for Japanese populations with a variety of dietary intakes.

Inclusion Criteria:

Participant in the Circulatory Risk in Community Study (CIRCS), a community-based cohort of 40- to 69-year-old residents in five Japanese communities.

Exclusion Criteria:

Participants with history of stroke or coronary heart disease at baseline.

Description of Study Protocol:

Recruitment

The subjects were 40- to 69-year-old residents of five communities selected for a community-based cohort of the Circulatory Risk in Community Study (CIRCS).

Design

Cross-sectional study.

Dietary Intake/Dietary Assessment Methodology

24-hour dietary recall, with interview by trained dietitians.

Blinding Used

Participants recruited for the nutrition survey were not informed beforehand that their usual nutritional status would be examined.

Statistical Analysis

- Multivariate regression was used to examine the effects of a one standard deviation (SD) protein intake on blood pressure
- Analysis was based on quartiles of total protein, animal protein and plant protein intakes.

Data Collection Summary:

Timing of Measurements

- Exposure and outcome were measured concurrently
- The surveys were carried out between 1973 and 1997.

Dependent Variables

Systolic and diastolic blood pressure using first measurement were taken by trained health professionals.

Independent Variables

Total, animal and plant protein intake per day measured by 24-hour recall dietary assessment.

Control Variables

- Community
- Age
- Sex
- Body mass index (BMI)
- Use of antihypertensive medication
- Ethanol intake
- Current smoking
- Sex-specific quartiles of sodium intake
- Potassium intake
- Calcium intake.

Description of Actual Data Sample:

- *Initial N:* 7,585 (3,499 males, 4,086 females)
- *Attrition (final N):* 7,585
- *Age:* 40 to 69 years
- *Ethnicity:* Japanese
- *Location:* Japan.

Summary of Results:

Key Findings

- After adjustment for cardiovascular risk factors and nutritional variables (sodium, potassium and calcium intake), the association between diastolic blood pressure (DBP) and total

protein intake was statistically significant only among women (P=0.022)
- After adjustment for cardiovascular risk factors and nutritional variables, the association between systolic blood pressure (SBP) and total protein intake was statistically significant only among women (P=0.019)
- After adjustment for cardiovascular risk factors and nutritional variables, the association between DBP and plant protein intake was statistically significant only among women (P=0.048)
- Among men and women without antihypertensive medication, a 13.1g per day increment in plant protein intake was associated with a decrease in SBP of 0.48mmHg and in DBP of 0.61mmHg (P=0.047 and P<0.001, respectively) after adjustment for cardiovascular disease risk factors.

Other Findings

After adjusting for cardiovascular risk factors only, total protein, animal protein and plant protein intake for all subjects was inversely associated with both systolic and diastolic blood pressure. Similar associations (after adjusting for cardiovascular risk factors only) between protein intake (total, animal and plant) were seen when the population was restricted to subjects not using antihypertensive medications.

Author Conclusion:

An inverse association was found between total protein intake and diastolic blood pressure and between animal protein intake and systolic blood pressure after adjustment for cardiovascular disease risk and nutritional factors.

Reviewer Comments:

Study Strengths

- *Large, community-based and free-living population*
- *Adjustment for several confounding factors.*

Study Limitations

- *Single, 24-hour dietary recall*
- *First blood pressure measurement were used, rather than second or average*
- *The separate analysis considering only those who did not use antihypertensive medication was only adjusted for cardiovascular risk factors (and not additional nutritional factors, which seemed to be important in the main analysis).*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes

2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes

3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	N/A
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes

6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	Yes
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes

9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes